SBI3U Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Evolution Test

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part A: Multiple Choice.** Place the letter of the best answer **in the margin** to the left of the question. (1 mark each)

*CATEGORY: Knowledge/Understanding (25 marks)*

1. According to geological evidence, the Earth was formed approximately

a) 200 million years ago

b) 4.5 million years ago

c) 20 billion years ago

d) 4.5 billion years ago

2. Genetic studies of snails living in backyard gardens in a town in Texas show drastically different allele frequencies. These populations are separated by alleys and city streets. What type of speciation is occurring here?

|  |  |
| --- | --- |
| a) sympatric | b) genetic drift |
| c) allopatric | d) directional |

1. Mules are the sterile offspring of a horse-donkey cross. This is an example of which type of reproductive isolating mechanism?

a) zygotic mortality b) hybrid inviability c) hybrid infertility d) gametic isolation

4. Bats and birds can both fly. This is an example of:

|  |  |
| --- | --- |
| a) Convergent evolution | b) homology |
| c) Divergent evolution | d) Coevolution |

1. Variation in populations is present because:

a) mutation b) crossing over c) sexual selection

d) natural selection e) both a) and b) are correct

6. The term founder effect is defined as which of the following?

|  |  |
| --- | --- |
| a) any change in gene or allele frequencies in a population | b) The establishment of a population in a new region |
| c) rapid population decrease | d) the movement of alleles from one population to another |

1. In the Galapagos finches, the term used to describe the adaptation of the 13 individual species from a common ancestor is:

a) Adaptive evolution b) adaptive radiation

c) Adaptive succession d) adaptive differentiation

1. The total number of alleles in a population is termed:
2. Gene pool
3. Allele frequency
4. Gene frequency
5. Genotype frequency
6. Variation
7. Hollow bones in birds that fly is acted on by what type of selection pressure?
8. Disruptional selection
9. Stabilizing selection
10. Directional selection
11. No selection
12. Speciation occurs with what type of selection pressure?

a) Disruptional selection

b) stabilizing selection

c) directional selection

d) no selection

1. Similar structures which serve different functions:
   1. Homologous
   2. Analogous
   3. Vestigial
   4. Phyletic

12. Which of the following is **not** a feature of the Hardy-Weinberg equilibrium?

a) population size is large

b) mating is random

c) no migration occurs

d) there is no selection pressure

e) genes can randomly mutate

13. Which term describes a dramatic, often temporary reduction in population size, usually resulting in specific genetic drift?

a) speciation

b) genetic bottleneck

c) macroevolution

d) microevolution

14. Tiktaalik was a valuable transitional fossil found in the Canadian arctic that helped tremendously explain which key evolutionary transition?

a) single-celled to multicellular organisms

b) plants to animals

c) reptile to bird

d) fish to tetrapod

15. Vestigial features include:

a) gills of a fish b) the human larynx

c) hip bones of a snake d) white fur of a polar bear

16. Duck hunting typically results in the death of the loudest quacking ducks. This will result in:

a) disruptive selection b) directional selection

c) stabilizing selection d) no selection pressure

17. Hummingbirds evolve to have longer beaks for nectar and orchids evolve to have their nectar deeper inside the flower. This is an example of:

a) Adaptive Radiation b) Divergent Evolution

c) Convergent Evolution d) Coevolution

18. Reduced hybrid viability occurs when hybrids that are reproductively isolated from their parents:

a) are infertile

b) do not develop past the embryonic stage

c) do not survive to reproductive maturity

d) are fertile, but produce offspring with reduced viability.

19. Which statement is true about natural selection?

a) bottlenecks and the founder effect reduce the influence of genetic drift

b) sexual selection is a form of natural selection in which traits that specifically enhance the mating success are favoured

c) directional and disruptive selection act to limit evolutionary change by favouring the current population norms

d) stabilizing selection produces evolutionary changes by favouring individuals that differ from the population norm

20. The process of evolution whereby there are slow gradual changes, marked by periods of rapid change is known as:

* 1. Speciation
  2. Genetic Drift
  3. Gradualism
  4. Punctuated equilibrium

21. Divergent evolution is exhibited most clearly by which two animal pairs?

a) whales and elephants b) sharks and dolphins

c) squirrels and chipmunks d) lions and giraffes

22. A species of the vampire bat inhabited an island. A Tsunami destroyed much of the island’s vegetation, including all of the trees. Few bats survived. In the present population, the wings of the bat are too small to be functional. They now occupy a niche similar to that of a rodent. The most probable explanation for this change is which of the following:

a) a new type of bat was introduced to the island

b) natural selection no longer favoured those who could fly

c) all the bats that could fly left the island

d) the bats didn’t need their wings anymore, so they disappeared

23. How does inbreeding affect genetic variation within a population?

a) variation decreases

b) variation increases

c) variation does not change

d) variation increases, then decreases

e) variation decreases, then increases

24. Who came up with the theory of “use and disuse”?

a) deBuffon

b) Lyell

c) Lamarck

d) Cuvier

25. What is the overall end product of the process of natural selection?

a) genetic variation

b) adaptation

c) genetic drift

d) mutation

**Part B:** **Short Answer (50 marks):** Answer the questions below in the space provided. Marks indicated in parenthesis.

1. Which type of selection lead to the following characteristics. For a) and c) draw fully labelled graphs illustrating the specific selection pressure**. (8 marks)**

1. Only male lions with very long manes can mate with females and pass on their genes:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The courtship dance of the Blue Footed Booby: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. The diversity of Darwin’s Finches: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Great White Sharks have changed very little over millions of years: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. a)What is divergent evolution? Describe two outcomes of divergent evolution. **(3 marks)**

b) what is ONE outcome of convergent evolution? **(1mark)**

1. A scientist is searching for evidence to support the theory of evolution. She has put together several observations. Using her observations, explain how each provides evidence for the theory. **(6 marks)**
2. The homologous anatomy of embryonic gills in humans, salamanders, fish, tortoise, and chickens
3. The contrivance of a panda’s thumb
4. The human appendix
5. Lamarck’s theories of evolution were both flawed and correct. If you were to travel back in time and have a discussion with Lamarck, what would you tell him about what you have learned in this unit that could perhaps change his mind? What was correct about Lamarck’s theory? **(2 marks)**
6. Identify the type of sympatric speciation that results from an asexually reproducing organism. **(1 mark)**

6. What is the definition of evolution? **(1 mark)**

7.Identify the types of isolating mechanisms that keep species separate in the following scenarios: **(4 marks)**

* 1. In some bird species, such as the flamingo, the male possesses a penis, while in others, such as the heron, a male does not. A male heron cannot mate successfully with a female flamingo.
  2. During spring nights, the distinctive calls of male wood frogs and spring peepers can be heard coming from the same pond.
  3. An ewe impregnated by a male goat suffers delivers a stillborn.
  4. Sticklebacks spend most of their time feeding close to the shoreline of a lake that is also inhabited by sticklebacks that feed mostly in deep water near the lakebed.

8. The human population of Iceland was founded by a relatively small initial population more than 1000 years ago. Would you expect the genetic diversity of Icelanders to be more or less than the genetic diversity of Canadians? Explain your reasoning using specific terms from this unit. **(2 marks)**

9. You have sampled a large stable population in which you know that the frequency of the homozygous recessive genotype (aa) is 49%. Calculate the allele frequencies in this population. **(3 marks)**

10. If 9% of an African population is born with a severe form of sickle-cell anemia (ss), what percentage of the population will be resistant to Malaria because they are heterozygous for the sickle-cell gene? If there is a small community of 2300 people in an African country, determine how many people in the community will be carriers of sickle-cell anemia. **(5 marks)**

11. Construct a cladogram based on the following morphological evidence: **(4 marks)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Limbs | Large brain | Forked penis | Back  bone | Placenta | Bony shell | Hair | Fetal membranes |
| koala bear | + | - | - | + | - | - | + | + |
| crocodile | + | - | - | + | - | - | - | + |
| chimpanzee | + | + | - | + | + | - | + | + |
| trout | - | - | - | + | - | - | - | - |
| salamander | + | - | - | + | - | - | - | - |
| mouse | + | - | - | + | + | - | + | + |
| opossum | + | - | + | + | - | - | + | + |
| painted turtle | + | - | - | + | - | + | - | + |

1. To what species is the chimpanzee most closely related? How do you know? **(2 marks)**
2. Is the crocodile more closely related to the salamander or the mouse? Explain. **(2 marks)**

12.A selection of hominid skulls are analyzed, and their opisthion indexes are measured. The results are as follows:

|  |  |
| --- | --- |
| **Skull #** | **Opisthion Index** |
| 1 | 13.2 |
| 2 | 29.0 |
| 3 | 27.0 |
| 4 | 24.6 |

Which skull is likely to be the closest relative to a modern day human? Explain how you know. **(2 marks)**

13.Name the scientist who first studied the details of fossils. Using a diagram, describe the relationship between the complexity of the fossil and its location in the sediment. Explain how this relationship provides evidence for evolution. . **(4 marks)**